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DEC 18 1920

HEALTH BULLETIN No. 12

# *Beriberi and How To Prevent It*



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DEPARTMENT OF THE INTERIOR

*Bureau of Public Health*

MANILA  
BUREAU OF PRINTING  
1913

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## BERIBERI AND HOW TO PREVENT IT.

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Beriberi is a disease that has been responsible for the deaths of thousands of persons annually throughout the Orient, besides the making of chronic invalids of many more thousands, and the incapacitating for gainful occupations of even greater numbers. It has been the general experience that beriberi affected particularly the strong, for which reason the harm done to the community was doubly great, because it attacked its earning capacity in its most vital place.

Until very recently there was no satisfactory explanation as to the cause of the disease, but, fortunately, within the past few years much information has come to light, so that at present at least it is possible to prevent outbreaks and, if the disease has not advanced too far, to cure it in those who already have it.

In the Philippine Islands, for instance, it is estimated that there are at least 5,000 deaths annually due to beriberi, and it seems probable that subsequent investigations may show that the disease is intimately associated with the high infant mortality. If this should prove to be true, at least another 20,000 deaths may be charged against it. On account of its importance it may therefore not be amiss to give a brief description of the disease, the manner in which it is conveyed, and how it may be prevented.

### DEFINITION OF BERIBERI.

Beriberi is a multiple neuritis and is characterized by motor and sensory paralysis and dropsy, which means that the disease is an inflammation of many nerves throughout the body and that inflammation causes a partial or complete loss of the use of the muscles supplied by such nerves. The sensory nerves, or nerves of feeling, show the effect of the inflammation by severe pain, and still there are other nerves which supply the blood vessels and govern nutrition, which manifest the disorder by permitting the vessels to leak and the fluid to collect in the tissues and by failing to repair the

loss from waste and thus cause great emaciation which is often not noticeable on account of the dropsical swelling of the body.

#### HISTORY.

The disease is believed to be of great antiquity in China. In the early years of the nineteenth century it attracted much attention among Anglo-Indian surgeons. The opening of Japan gave an opportunity to European physicians holding university positions to investigate the disease, and much information and many empirical rules for preventing it became available. The Japanese themselves studied the disease considerably during their two recent wars and used methods that assisted in the reduction of its ravages. In the war of 1894 between Japan and China nearly half the Japanese troops had beriberi, and in the war of 1904-5 there were 85,000 cases reported.

#### DISTRIBUTION IN THE PHILIPPINES.

The disease formerly prevailed most extensively in Government institutions, and particularly among sailors on ships, lighthouse keepers, soldiers, inmates of charitable institutions, and of leper colonies, in labor camps, and among Chinese laborers and artisans, and especially among prisoners in provincial jails.

#### CAUSE OF THE DISEASE.

In the past there have been many causes assigned for the disease, as, for instance, overcrowding and poor ventilation in ships, jails, asylums, etc.; that the disease was due to bacteria which grew on rice and perhaps left a toxin; and to many other causes; but lately almost conclusive evidence has been made available to show that the disease occurs in the Tropics almost exclusively among those who use white rice as a staple article of diet.

In experiments made by Fraser and Stanton in the Straits Settlements, by Aron in the Philippines, and others, it was shown, in the first place, that polyneuritis among chickens and beriberi in human beings are due to the same causes. In order to prove that polished rice is associated with beriberi, a series of chickens were placed in cages, numbered from 1 to 20, and then all the chickens in the odd-numbered

cages were fed only on water and polished rice of the best grade, while all the chickens in the even-numbered cages were given only water and unpolished rice. In a few weeks the chickens in the odd-numbered cages showed unmistakable evidences of illness which proved to be polyneuritis, and when the use of polished rice was continued the chickens soon died. On the other hand, all of the chickens in the even-numbered cages that were fed unpolished rice remained perfectly well. The conditions of the experiment were then reversed. Those in the odd-numbered cages were given unpolished rice and those in the even-numbered cages polished rice. The chickens in the odd-numbered cages soon began to improve and in a short time were entirely well, while those that had heretofore remained well and were now using polished rice soon became ill in the same manner as the chickens that had previously been fed on polished rice.

Fletcher subsisted 123 inmates of the Kuala Lumpur Lunatic Asylum on ~~unpolished~~<sup>POLISHED</sup> rice and 123 on ~~polished~~<sup>UNPOLISHED</sup> rice. Among the first group 43 cases of beriberi occurred and in the second group there were none. The two groups exchanged buildings, but no cases occurred among the unpolished rice group. They then exchanged their rice, the first group using unpolished and the second group polished rice. No further cases occurred in the first group, but beriberi soon developed among the persons in the second group that were now using polished rice.

Later, a large number of men were sent to the interior of the Straits Settlements to build a railroad. One half of the men were subsisted on polished rice and the other half upon unpolished rice. It was soon found that those who lived on polished rice became ill with beriberi, while those who had unpolished rice showed no symptoms of this disease. In order to prove that the disease was not conveyed by infection, the people who were eating the unpolished rice exchanged clothing and houses with those who were eating the polished rice, but they still remained well. Again the experiment was reversed and those who had been eating polished rice were given unpolished rice and *vice versa*, and in a short while those who were ill with beriberi began

to improve and those who used polished-rice diet began to show symptoms of beriberi.

During the time that these experiments were being carried out in the Straits Settlements, similar experiences were had in the Philippine Islands. For instance, at the Culion Leper Colony beriberi had prevailed very extensively and was causing from 60 to 80 deaths a month. Instead of using polished rice, as had been done previously, unpolished rice exclusively was used, and in a short while the disease disappeared completely.

Among the Scouts of the United States Army similar results were obtained. Among these soldiers the disease had prevailed very extensively. In one year over 600 cases were reported. After the use of unpolished rice was begun the disease disappeared entirely, and there have been no further cases among these troops.

The Governor-General of the Philippine Islands then issued an executive order prohibiting the use of polished rice in all Government institutions; and wherever this was placed in effect the disease soon disappeared. It has been shown conclusively that the few isolated cases that have originated were due to the fact that the institution had not adhered strictly to the regulation with regard to the use of unpolished rice.

#### **WHY DOES POLISHED RICE CAUSE BERIBERI IN SOME AND NOT IN OTHERS?**

Upon further investigation it was found that the chemistry of the outside of the rice grain differed from that of the inside of the rice grain. In other words, when rice is polished the outer coating (pericarp) is removed. In speaking of rice, it should be remembered that we are now dealing with the grain after the hull has been removed, but even after this has occurred the rice grain is still similar to an orange or an apple; in other words, there still exists around its outer surface a coating or layer which corresponds to the peeling of an orange or an apple, and in this outer coat or pericarp or peeling there exist certain principles which are essential in order that rice may supply the proper nourishment for the human body. It will be apparent, then, that if this outer layer is polished

away, the systems of persons, whose principal article of diet is rice, are being deprived of an essential substance. There is further evidence to show that this same substance that exists on the outside of the rice grain is also present in other foods, especially in beans, mongoes, yeast, and probably in many other things, so that persons who live on a more or less diversified diet are seldom found to be afflicted with beriberi even if they do consume polished rice. This fact accords very closely with the distribution of the disease. It has been known for a great many years that Europeans seldom suffered from beriberi. It is now apparent that this is due to the fact that they live on a diversified diet. It may be of interest to mention that some years ago an American who became stranded at a lighthouse developed beriberi. On account of lack of other foods he was compelled to live almost entirely upon rice for a number of months.

The polishings or substance that is removed from the outside of the rice grain is known in many parts of the Philippines as tiquitiqui. It is also a well-known fact that it has long been the custom to feed tiquitiqui to chickens in order to fatten them rapidly. Science has now demonstrated that tiquitiqui is not only good for chickens but for human beings as well.

Beriberi occurs more frequently in tropical and subtropical countries, not because of any peculiarities of the climate, but because many of the residents use white rice as a staple article of diet.

#### HOW DOES BERIBERI AFFECT INFANTS?

It will naturally be asked, How can unpolished rice be responsible for deaths among infants who do not eat rice? Investigations have not gone sufficiently far to demonstrate conclusively that white rice is associated with the infant mortality; but there is considerable evidence to show that such is likely the case. For instance, over half the children born in the city of Manila die before they reach 1 year of age. This corresponds to the period of their lives when they are almost entirely dependent upon their mothers' milk for nourishment. Now, if the mother subsists almost entirely on white rice, she is deprived of an essential nutri-

tive principle so that the milk which she yields must also be lacking in this principle, and the child she nourishes with her milk may develop beriberi. The disease supposed to be thus caused which is so frequently a factor in infant mortality is known in the Philippines as *taón*.

#### WHAT IS THE CAUSE OF TAON?

Many physicians believe that *taón* and infantile beriberi are the same disease. At all events, there is much evidence available to show that when a mother subsists upon unpolished rice the disease *taón* disappears in her infant, which in itself is an important discovery.

#### EXPERIENCE IN OTHER COUNTRIES.

Experiences in the Federated Malay States, Java, India, China, Hongkong, and other places coincide very closely with the experience in the Philippine Islands, namely, that where beriberi occurs it is intimately associated with the consumption of white rice as a staple article of diet, and that the disease can generally be eradicated either by the use of unpolished rice or a diversified diet, such as beans, peas, mongoes, meat in addition to the rice, etc.

#### HOW MAY BERIBERI BE PREVENTED?

From what has been said it is already apparent how the disease can be successfully prevented.

The result of the studies which have been made by medical men with regard to beriberi again shows in a most forcible manner the advantages of modern science. Here is a disease that for years and years has defied all efforts at eradication or successful treatment, now yielding to a remedy as simple as proper diet or merely the use of unpolished rice.

The application of this knowledge, however, is not such a simple matter. Considerable difficulty has already been encountered in the attempt to administer the remedy. For instance, in Government institutions, when unpolished rice was furnished, ignorant individuals thought that the Government was attempting to substitute a cheap form of rice for the polished kind that had been in use heretofore, and in many instances they refused to eat it. In order to dispel such ignorance, it is most desirable that all intelligent per-

sons assist in the dissemination of the knowledge that beriberi is caused by consuming as a staple article of diet white rice, and that it may be prevented by the use of unpolished rice. Many persons are of the opinion that white rice is more appetizing than the unpolished rice, which is naturally darker; but those who have given the matter a fair trial are almost invariably of the opinion that the unpolished rice has a better and richer flavor than the white rice and that the white rice has only been preferred heretofore because it became the custom to eat it. Those to whom this knowledge has come may assist very much in the eradication of beriberi in the Philippine Islands by setting an example by using unpolished rice. Even those whose diet is sufficiently diversified to provide them the essential elements of nutrition should assist in this movement by using unpolished rice, in order to set an example to those who are not so favorably situated as to be able to have a proper diet.

This terrible disease may be entirely prevented in the Philippine Islands without increasing the cost of living. By simply substituting unpolished rice for white rice, there is every reason to believe that its complete disappearance can be effected.

It has been suggested lately that in order to hasten the general use of unpolished rice a tax of 4 centavos a kilo be placed upon polished rice and that unpolished rice be admitted duty free. This would accomplish the purpose by making polished rice too expensive for general use, thus limiting its sale to the rich, who could protect themselves by a diversified diet, thus bringing about the desired result indirectly.

Rice which is hulled by hand in the Philippines is practically always a safe rice to use, so that it is only the machine-milled rice of extreme whiteness that is dangerous when used as a staple article of diet.

The people of the Philippines have it within easy grasp to eradicate this disease from the Islands and at the same time they can set an example for the remainder of the Orient that might result in the saving of thousands of lives in those countries.